

REMARKS

Claims 9-11, and 25-37 are currently pending in this application. By this amendment, claims 9-11 have been amended, claims 19-24 have been cancelled, and claims 25-36 have been added. Of the currently pending claims, claims 9, 29, and 32 are independent. Applicant respectfully submits that the above amendments do not add new matter to the application and are fully supported by the specification at least at page 5, lines 1-19.

In view of the above amendments and the following Remarks, Applicant respectfully requests reconsideration and timely withdrawal of the pending rejections for the reasons discussed below.

Introductory Remarks

Applicant's claimed invention is directed to carbon foam having a unique combination of properties that allow it to be used as a radar emissions absorbing material. In particular, the claimed invention is directed to carbon foam having the combination of a dielectric constant in the range of about 2 to about 6 and an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm. It is this combination of properties for carbon foam that demonstrate excellent radar emission absorptivity in the megahertz and gigahertz ranges. For example, in the specification it recites,

carbon foams exhibiting a dielectric constant of from about 2 to about 6 and simultaneously an electrical resistivity in the range of between about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm, demonstrate excellent radar emission absorptivity in the megahertz and gigahertz ranges.

Specification at page 4, lines 20-23.

Not all carbon foams have the same properties or combination of properties. For example, depending upon processing conditions, the properties of carbon foam can vary. This is exemplified in Figure 2 of Applicant's specification where the same type of green foam (coal-based green foam) was calcined at different temperatures. Figure 2 clearly illustrates how the electrical resistivity for resulting carbon foam changes over a wide range of calcining soaking temperatures. As can be seen in Figure 2, as the carbon foam soaking temperature increases from 0° to 3000°C, the electrical resistivity of the carbon foam decreases from $10E^{+07}$ to $10E^{-02}$ ohm-cm.

Figure 2 can be broken down into three distinct regions. Comparison of each of these regions illustrate the changing and differing properties of carbon foam treated at different calcining temperatures. The first region represents carbon foams that have been heat treated above 800°C. According to Figure 2, these carbon foams exhibit electrical resistivities below about $1E^{-01}$ ohm-cm. The second region represents carbon foams that have been heat treated at temperatures ranging from 600°C to 800°C. According to Figure 2, carbon foams heat treated at temperatures ranging from 600°C to 800°C exhibit electrical resistivities ranging from about $1E^{+00}$ to about $1E^{+06}$ ohm-cm. The third region represent carbon foams that have been heat treated below 600°C. Carbon foams heat treated in this region exhibit electrical resistivities above $1E^{+06}$. Figure 2 clearly illustrates that based upon the calcining heat treatment for green carbon foam, the electrical resistivity for the carbon foam will vary. As Figure 2, clearly illustrates, not all carbon foams have the same electrical resistivity.

Embodiments of Applicant's claimed invention is directed to carbon foams that fall within the second region of Figure 2, i.e., carbon foams exhibiting an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm.

Electrical resistivity is only part of the invention. The additional component to applicants claimed invention is that the carbon foam have a dielectric constant ranging from about 2 to about 6 in combination with the claimed electrical resistivity. It is this combination of properties that provide a carbon foam that demonstrate excellent radar emission absorptivity in the megahertz and gigahertz ranges. Id. The specification teaches that the dielectric constant changes based on the processing conditions of the carbon foam. Specification at page 4, lines 6-18. The specification teaches that to get the claimed combination of electrical resistivity and dielectric constant, the carbon foam is heat treated in a relatively narrow range of from about 600°C to about 800°C. Attainment of the desired combination of dielectric constant (reactance) and resistivity is achieved after soaking at these temperatures for only a matter of minutes, preferably from about 2 to about 30 minutes under an inert gas. Specification at page 4, line 20 – page 5, line 8.

As will be discussed below, each of the cited references utilizes conditions that according to Applicant's specification, would provide a carbon foam that does not exhibit the claimed features of an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

Rejections Under 35 U.S.C. § 102/103 - Rogers

Claims 9-12, and 14-18 stand rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over U. S. Patent No. 6,656,238 issued to Rogers, ("Rogers"). Applicant respectfully traverses this rejection for at least the following reasons. 35 U.S.C. §102 (b) requires that "the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States." The present application was filed on October 12, 2001. Roger was published as a patent on December 2, 2003. Rogers was not patented or described in a printed publication more than one year prior to the date of the present application. Accordingly, Rogers does not qualify as prior art under 35 U.S.C. §102(b). See MPEP §706.02(a). Applicant respectfully requests the withdrawal of the 35 U.S.C. § 102(b)/103(a) rejection based on Rogers.

Rejections Under 35 U.S.C. § 102/103 – Stiller

Claims 9-11 and 14-18 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U. S. Patent No. 5,888,469 issued to Stiller, et al., ("Stiller") or in the alternative, under 35 U.S.C. § 103(a) as obvious over the Stiller. Applicant respectfully traverses this rejection for at least the following reasons. Claims 14-18 have been cancelled. New independent claims 29 and 32 have been provided.

Claim 9 and new claims 29 and 32 each require a carbon foam having an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

The Examiner states that “the carbon foam of Stiller is identical to or only slightly different than the claimed carbon foam prepared by the method of the claim, because both articles are formed from the same particulate coal having the same particle size.” Office Action dated Feb. 23, 2005 at page 7. Applicant respectfully disagrees.

Stiller discloses calcining the green carbon foam at 975°C to 1025°C. Stiller, col. 4, ll. 36-37. As discussed above and illustrated in Figure 2, calcining a green carbon foam to temperatures above 800°C would produce a carbon foam product in region one with an electrical resistivity below about $1E^{-01}$ ohm-cm. Accordingly, Stiller fails to disclose, teach, or suggest a carbon foam having an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm. Further, Stiller is silent with respect to a carbon foam having a dielectric constant in the range of about 2 to about 6 as recited in claims 9, 29, and 32.

The Examiner suggested incorporating a carbonizing temperature in the range from 600°C to 800°C and the time for soaking the carbon foam into the claims. *Id.* Claim 9 has incorporated these processing steps.

Since the all the limitations of claims 9, 29, and 32 are not present, taught or suggested in Stiller, Applicant respectfully submit that claims 9, 29, and 32 are not anticipated or obvious over Stiller. Accordingly Applicant respectfully requests withdrawal of the 35 U.S.C. § 102(b) / § 103(a) rejection of claims 9-11. Since the prior art of record does not disclose, teach, or suggest all the features of the claimed invention, Applicant respectfully submits that independent claims 9, 29, and 32 and all the claims that depend therefrom are allowable.

Rejections Under 35 U.S.C. §103 – Stiller in view of Klett

Claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Stiller in view of U.S. Patent No. 6,673,328, issued to Klett et al., (“Klett”). Claim 12 has been cancelled. To the extent that this rejection would apply to new claims 29 and 32, Applicant submits that claims 29 and 32 are patentable over Stiller in view of Klett for at least the following reasons.

Claims 29 and 32 require carbon foam having an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

As discussed above, Stiller fails to disclose, teach, or suggest a carbon foam having an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6 as recited in claims 29 and 32. These deficiencies are not supplied by Klett. Similar to Stiller, Klett discloses making a green carbon foam and heat treating the green carbon foam at elevated temperatures of 1050°C, 2500°C, and 2800°C. Klett, col. 7, ll. 6-9. As discussed above and illustrated in Figure 2, heat treating a green carbon foam to temperatures above 800°C would produce a carbon foam product in region one with an electrical resistivity below about $1E^{-01}$ ohm-cm. Accordingly, Klett fails to disclose, teach, or suggest a carbon foam having an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6 as recited in claims 29 and 32.

Accordingly, the combination of Stiller and Klett fails to disclose teach or suggest a carbon foam having an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

Since the all the limitations of claims 29 and 32 are not present, taught or suggested in the combination of Stiller and Klett, Applicant respectfully submits that independent claims 29 and 32 and all the claims that depend therefrom are allowable.

Rejections Under 35 U.S.C. §102 – Klett

Claims 12, 14, and 15 stands rejected under 35 U.S.C. § 102(e) as being anticipated by Klett. Applicant respectfully traverses this rejection for at least the following reasons. Claims 12, 14, and 15 have been cancelled. To the extent that this rejection would apply to new claims 29 and 32, Applicant submits that claims 29 and 32 are patentable over Klett for at least the following reasons.

Claims 29 and 32 require a carbon foam having an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

The Examiner has taken the position that “Klett is heating the green foam to a temperature within the range disclosed in the Applicants’ specification to achieve the claimed electrical resistivity. Therefore, it is believed by the examiner that the electrical resistivity and dielectric constant would be inherently present.” Office Action at page 7. Applicant respectfully disagrees.

As discussed above, Klett discloses making a green carbon foam and heat treating the green carbon foam at elevated temperatures of 1050°C, 2500°C, and 2800°C. Klett, col. 7, ll. 6-9. As discussed above with respect to Figure 2, heat treating a green carbon foam to temperatures above 800°C produce a carbon foam product in region one with an electrical resistivity below about $1E^{-01}$ ohm-cm. Claims 29 and 32 require an electrical resistivities

ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm. Therefore, the Examiners contention that green foams are being heated in the same range and that the electrical resistivity and dielectric constant would be inherently present cannot be supported. Accordingly, Klett fails to disclose, teach, or suggest a carbon foam having an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm. Further, Klett is silent with respect to carbon foam having a dielectric constant in the range of about 2 to about 6 as recited in claims 29 and 32.

Accordingly, Klett fails to disclose teach or suggest a carbon foam having an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6. Since the all the limitations of claims 29 and 32 are not present, taught or suggested in Klett, Applicant respectfully submits that independent claims 29 and 32 and all the claims that depend therefrom are allowable.

Rejections Under 35 U.S.C. § 102/103 – McCullough

The Examiner has rejected claims 12, 14 and 15 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,999,385, issued to McCullough, Jr. et al., (“McCullough”) or in the alternative under 35 U.S.C. § 103(a) as obvious over McCullough. Applicant respectfully traverses this rejection for at least the following reasons. Claims 12, 14, and 15 have been cancelled. To the extent that this rejection would apply to new claims 29 and 32, Applicant submits that claims 29 and 32 are patentable over McCullough for at least the following reasons.

Claims 29 and 32 require a carbon foam having an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

The examiner has taken the position that “McCullough foam has the volume resistivity within the claimed range and volume resistivity is related to dielectric constant. Therefore, it is not seen that the carbonaceous foam of McCullough, Jr. would have a dielectric constant outside the claimed range as the volume resistivity is within the claimed range.” Office Action at page 8. Applicant respectfully disagrees.

The Examiner has made the assertion that since McCullough discloses carbon foams having electrical conductivities overlapping the claimed range, the dielectric constants will also overlap the claimed range. This proposition is put forth without documentary evidence by the Examiner. If the Examiner intends to rely on this assertion, Applicant respectfully requests that the Examiner provide documentary evidence to support this assertion in accordance with MPEP §2144.03. As discussed below, Applicant’s specification teaches not all carbon foams exhibit the claimed electrical resistivities in combination with the claimed dielectric constant.

As discussed in the Introductory Remarks, the dielectric constant shifts as the carbon content of the foam changes. As the treatment temperatures and conditions change, the dielectric constant changes. Specification at page 4, lines 6-18. Applicant’s specification teaches that in order to get the claimed electrical resistivity in combination with the claimed *dielectric* constant, green carbon foam is heat treated at temperatures ranging from about 600°C to about 800°C for relative short periods of time between about 5 and about 20 minutes. *Id.* at page 5, lines 1-7.

Turning to McCullough, McCullough disclosing preparing polymer foams, heat treating the polymer foams, and measuring their electrical resistivities. McCullough discloses heat treating these carbon foams between 175° and 1500°C. McCullough, col. 4, ll. 31-34. In particular, McCullough discussed three groups of carbon foams. Group one was classified as electrically nonconductive. Foams with a nitrogen content of about 20% or more are electrically

nonconductive with electrical resistivities greater than 10^3 ohm-cm, and typically greater than 10^7 ohm-cm. *Id.* at col. 4, ll. 35-46. Group two was classified as having low conductivities with specific resistance of about 10^3 to 10^1 ohm-cm. *Id.* at col. 4, ll. 47-54. For groups one and two, no information was provided with respect to dielectric constant, heat treatment temperatures, or treatment times. A third group was identified as being highly electrically conductive with specific resistance of less than 10^1 ohm-cm. This group is heat treated above about 750°C for a period of time to increase the carbon content. *Id.* at col. 4, ll. 55-63. No information was provided with respect to dielectric constant or treatment times.

While it appears that the electrical resistivities of carbon foams in groups one, two and three of McCullough overlap the claimed electrical resistivities, there is no guidance with respect to the dielectric constant values for these foams. Since McCullough did not provide enough details with respect to processing conditions, such as treatment times and temperatures, for these groups, it cannot be determined from this section of McCullough whether these foams have the same dielectric constants as those claimed. McCullough does provide additional details in the Example section with respect to processing conditions and measured values. In particular, Example 3 discloses that carbon foams were heat treated at temperatures of 525°C , 550°C , 650°C , and 850°C . *Id.* at col. 6, l. 55 – col. 7, l. 12. The electrical resistivities were measured at 10^8 ohm-cm, 10^7 ohm-cm, 10^6 ohm-cm, and 10^1 ohm-cm, respectively. Only the last two exhibit electrical resistivities within the claimed range. Example three indicates that all the carbon foam samples were heat treated at the desired temperature for about 1 hour. *Id.* According to the teachings in Applicant's specification, to get the combination of claimed electrical resistivity and claimed dielectric constant, the carbon foam is heat treated for times ranging from about 2 to about 20 min. Accordingly, McCullough discloses heat treating the carbon foam for times that

are much greater than those taught by Applicant that will produce a carbon foam with the claimed electrical resistivity in combination with the claimed dielectric constant.

Accordingly, Applicant respectfully contends that McCullough fails to disclose, teach, or suggest a carbon foam having an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

Since the all the limitations of claims 29 and 32 are not present, taught or suggested in McCullough, Applicant respectfully submits that independent claims 29 and 32 and all the claims that depend therefrom are allowable.

Rejection under Obviousness – Type Double Patenting

The Examiner has rejected claims 9-11 and 14-18 under the judicially created doctrine of obviousness-type double patenting for a variety of positions as articulated in paragraphs 14-21 of the Office Action. Applicant respectfully requests that these obviousness-type double patenting rejections be held in abeyance until allowable claims are indicated by the Examiner.

Subsequently, if necessary, the Applicant will file a terminal disclaimer to overcome the rejections.

Other Matters

Previously a three-month extension of time was provided extending the period of reply through May 16, 2006. Applicant believes that no extension of time is required at this time. If further extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned for under 37 C.F.R. § 1.136(a). Applicant believes that no further fees for net addition of claims are required at this time. Any fees required for

extensions of time and any fees for the net addition of claims are hereby authorized to be charged to Deposit Account No. 503310.

Applicant submits that a full and complete response has been made to the pending Office Action and respectfully submits that all of the stated objections and grounds for rejection have been overcome or rendered moot. Accordingly, Applicant respectfully submits that all pending claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is thus respectfully requested to pass the above application to issue.

Should the Examiner feel that there are any issues outstanding after consideration of this response; the Examiner is invited to contact the Applicant's undersigned representative at the number below to expedite prosecution. Prompt and favorable consideration of this Reply is respectfully requested. Applicant respectfully requests that a timely Notice of Allowance be issued for this application.

Respectfully submitted,



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Date: May 12, 2006

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